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TOMATO GROWING IN THE SOUTH.

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INTRODUCTION.

The importance of the tomato as a crop for the South has been greatly emphasized by the development of the trucking industry and the formation of tomato clubs, and this in turn has increased the demand for information regarding the production of the crop. While this bulletin is written especially to answer the questions which come from canning-club members and agents and for those who grow tomatoes for home use, the principles are applicable to the commercial production of tomatoes; but it is recommended that anyone intending to grow tomatoes on a commercial scale secure information from the agricultural college in his State and study the methods of experienced growers in the community.

SECURING EARLY PLANTS.

In order to secure a crop of early tomatoes the plants should be started during the winter, so as to take advantage of the early markets. Cold frames will be satisfactory for starting the seeds in the warmer sections of the South, as in the South Atlantic and Gulf Coast States, but in the cooler sections a hotbed should be used if an early crop is desired. Where a greenhouse is available it can be used to good advantage, but it would not pay to build a greenhouse for this purpose. If only a few plants are needed they can be grown in a small box in the living room, but in general it will be better to buy good hotbed or cold-frame grown plants.

HOTBEDS AND COLD FRAMES.

Hotbeds and cold frames should be located in a well-protected place, preferably on the south side of a fence or building, near a frequently traveled path and a good water supply. The drainage should be away from the bed. A hotbed consists of an inclosure covered with sash or canvas and supplied with some form of heat, usually fresh manure from the horse stable.

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Cold frames are made in the same way as hotbeds except that no manure or artificial heat is used. The frames may be covered by hotbed sash or cotton cloth. In most sections of the South, cloth will be satisfactory for the frame, and in the lower South the cold frame can be substituted for the hotbed for growing plants. (Fig. 1.)

A temporary hotbed, such as is used on many farms, can be made as follows: Secure fresh manure from the horse stable and shake it out into a broad pile on top of the ground, making the pile about 18 inches deep, 8 to 9 feet wide, and about 6 feet longer than the frame. (Fig. 2.) Compact the manure by trampling. After the manure has been packed, the frames to support the hotbed sash should be placed in position and arranged so the sash will slope toward the south. The frames are usually made of boards 1 inch thick. The front board

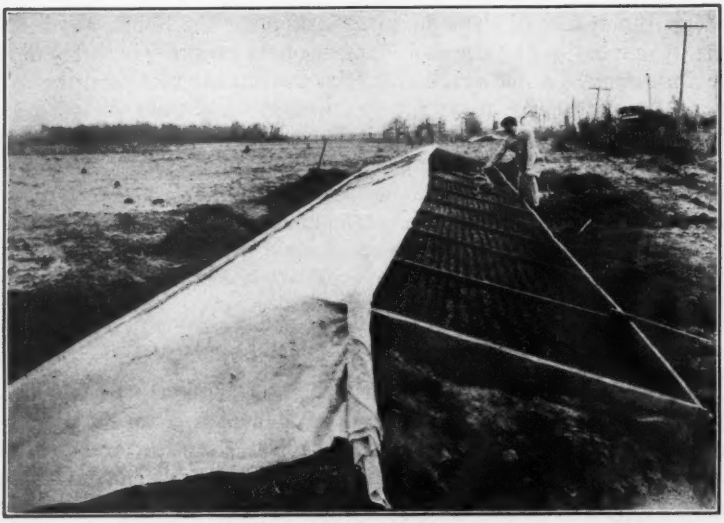

FIG. 1.—A type of frame used in the South for growing tomato plants. Canvas is used in place of hotbed sash.

should be 4 to 6 inches narrower than the back board, so as to give slope to the sash, as is shown in figure 3. The standard hotbed sash is 3 by 6 feet, so that the width of the bed should be 6 feet from the outside of the front to the outside of the back. It is a good plan to have crosspieces made to strengthen the frame and to serve as a guide for the sash, making it easy to slide the sash on and off as occasion demands. (Fig. 3.)

For a more permanent hotbed, make an excavation from 18 to 24 inches deep, 6 feet wide, and as long as desired. Fill this pit with manure and pack it firmly, as mentioned for the temporary bed. Drive down 2 by 4 inch posts at the corners and at intervals along the sides and nail 2-inch planks to the posts, so that the lower edge is a few inches below the surface of the ground on the outside of the

bed. Pack the soil against the frame to protect from cold. The permanent bed may be heated by steam or hot water instead of manure if it is more convenient.

FIG. 2.—Shaking out and piling manure for temporary hotbeds. The frame on the left is to be placed on the manure.

After making the hotbed, put from 4 to 6 inches of a good, loose loam soil on the manure and cover the bed with hotbed sash or cloth.

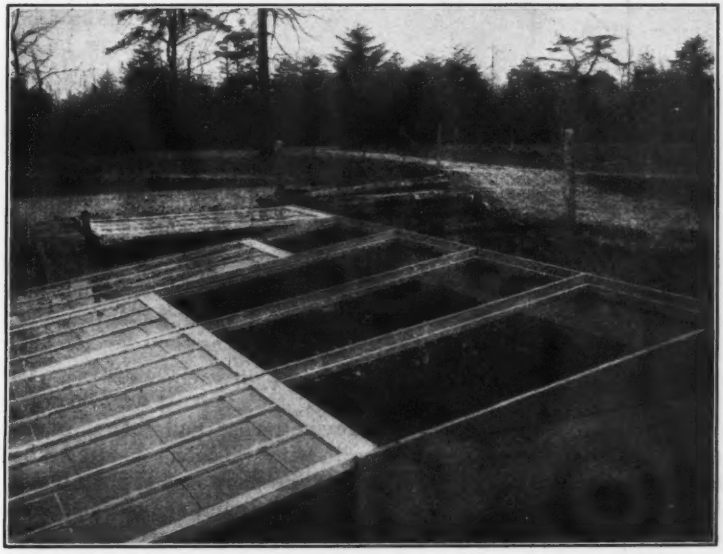

FIG. 3.—A small hotbed, showing crosspieces to support the sash.

For the first two or three days the heat in the bed will run quite high, due to the heating of the manure. The seed should not be planted until the temperature goes down to 80 or 85° F.

GROWING THE PLANTS.

Sow the seed in rows 3 or 4 inches apart, ¼ to ½ inch apart in the row, and cover about ½ inch deep. After the seeds have been covered, water the surface of the soil with a sprinkling can, being careful to distribute the water uniformly over the bed.

During bright days a bed covered with sash will heat up very quickly, and it will be necessary to give special attention to ventilation. This should be done by sliding the sash partly off the bed or by raising them on the opposite side from the wind. Toward evening close the sash in order to get the bed warm before night. Water the bed in the morning and on bright days. Watering late in the day or on cloudy days will increase the danger of freezing and damping-off. After watering, ventilate the bed so as to dry off the plants before night. The seed bed should never be allowed to dry out, but great care must be exercised in watering, as excessive moisture is conducive to the development of damping-off.

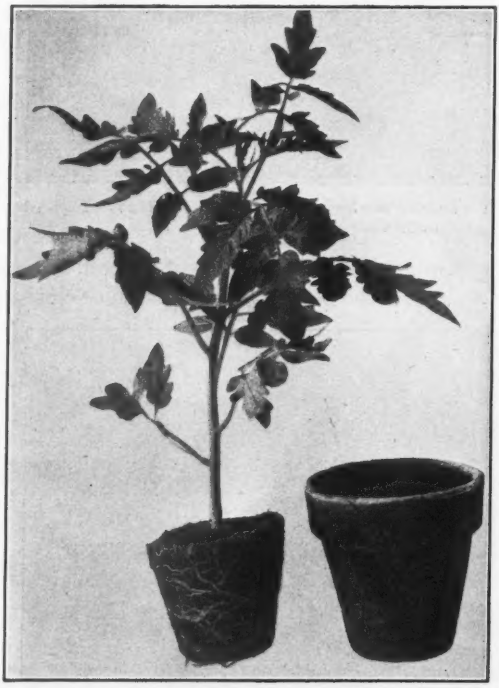

FIG. 4.—A good transplanted plant ready for setting in the field.

For a very early crop, transplant the young plants as soon as they develop their first true leaves. The plants may be transplanted to stand 2 inches apart each way in the bed, and when the plants reach a height of 3 or 4 inches and begin to crowd each other in the bed they should be taken up and transplanted into flowerpots, plant bands, old tin cans, or old strawberry boxes. Old tomato cans which have had the tops and bottoms melted off are very satisfactory for this purpose where the work is done on a small scale. On a large scale the grower will very seldom go to the trouble of transplanting the plants more than once, and quite often they are taken direct from the seed bed to the field. Where earliness is an important factor, the plants should be transplanted at least once, and on a small scale it will pay to

transplant twice. Figure 4 shows a good transplanted plant ready for setting in the field. This plant was transplanted two or three times

Before the plants are set out they should be hardened off, and this can be done by transferring them to a cold frame or by removing the hotbed sash during the day in mild weather. As the plants become hardened the covering may be kept off at night when there is no danger of frost. The hardening off must be done gradually in order to prevent any serious check to growth.

If a hotbed or cold frame can not be secured, the plants can be started in shallow boxes in the dwelling. The boxes should be filled with a rich, mellow soil and the seed sown the same as in a hotbed. Keep the boxes near a window and at the temperature of the living room. Unless the plants develop in the light, they will be weak and spindling. Close attention must be given to watering, as the air in the living room is usually dry and causes the soil to dry out quickly. On warm days the boxes containing the plants may be placed outside in the sun. The small plants should be transplanted to other boxes as soon as they have developed the first true leaves.

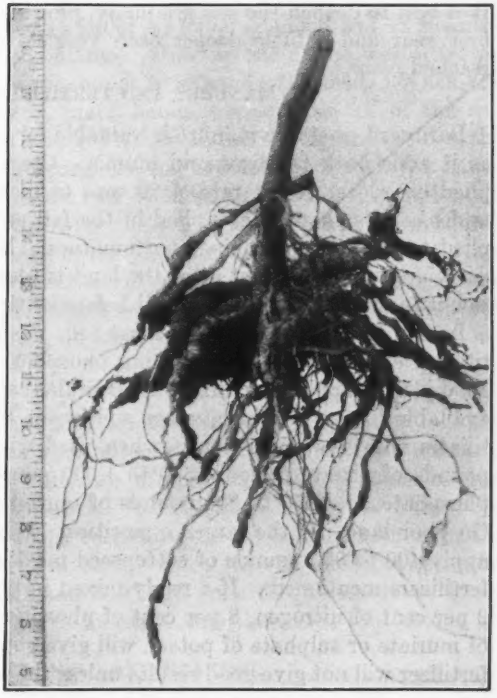

FIG. 5.—Root of a tomato plant affected with root-knot, caused by nematodes, or gallworms.

SOILS FOR TOMATOES.

Select, if possible, a well-drained sandy or sandy loam soil, preferably one nearly level. Avoid land that has been in tomatoes the year before, especially if there has been any disease on the plants, as many of the diseases live over winter in the soil. Soil on which cotton or any other crop has been injured by nematodes, or gallworms, causing root-knot, should also be avoided. Figure 5 shows roots badly infested with nematodes.

PREPARATION OF THE SOIL.

Plow the land in the fall if there is no danger of washing. Replow in the spring and thoroughly pulverize the soil by disking, harrowing, and dragging, or rolling. The depth to plow depends on the condition of the soil and the previous treatment it has received. A deep soil is desirable for tomatoes, but it would not be advisable to plow 8 inches deep if the previous plowing had been only 4 inches deep. It is best to deepen the soil gradually, plowing 5 or 6 inches deep the first year and a little deeper each year until the desired depth is reached.

MANURES AND FERTILIZERS.

Barnyard or stable manure is valuable for tomatoes on most soils, as it adds both fertilizer and humus. Coarse manure may be applied broadcast at the rate of 20 tons or more per acre and plowed under. This should be applied in the fall and plowed under or applied to the crop preceding the tomatoes. If well-rotted manure is used, apply it broadcast after the land is plowed. Thoroughly harrow it in and mix it with the soil before setting out the plants.

In addition to the manure, most soils need some commercial fertilizers, especially those furnishing phosphorus and potash. It is a good plan to apply a fertilizer that contains some nitrogen in a readily available form. For an average soil in the South the following fertilizers will give good results when used with manure: 100 to 150 pounds of nitrate of soda, 500 to 1,000 pounds of 16 per cent acid phosphate, and 150 to 300 pounds of muriate of potash to the acre. On poor land use the larger quantities. Where no manure is used apply 400 to 800 pounds of cottonseed meal in addition to the other fertilizers mentioned. If a ready-mixed fertilizer is used, one giving 2 per cent of nitrogen, 8 per cent of phosphoric acid, and 6 per cent of muriate or sulphate of potash will give good results. Commercial fertilizer will not give good results unless the soil is well supplied with humus. Where manure can not be secured, some crop such as cowpeas, soy beans, or some other legume should be turned under to supply humus and part of the nitrogen.

When large quantities of fertilizer are used, apply it broadcast and harrow it in. Fertilizer applied at the rate of 500 to 1,000 pounds per acre should be distributed in a strip along the row or in a furrow and thoroughly mixed with the soil to prevent the burning of the plants.

SETTING THE PLANTS IN THE FIELD.

The plants should not be set in the field until danger of frost is over. Have the soil well prepared before starting to plant. Mark off the rows about 4 feet apart with a 1-horse turnplow. The distance to set the plants in the row depends upon the methods of grow-

ing. If the plants are to be pruned to one or two stems and tied to stakes or trellises, 2 to 3 feet apart is sufficient space to give between the plants in the row. Where the plants are not pruned and staked, set 3 to 4 feet apart in the row. In a small garden where the plants are pruned and staked and all cultivation is done by hand, the rows can be 2½ feet apart with the plants 2 feet apart in the row.

Before taking up the plants from the hotbed or cold frame thoroughly soak the bed in order to have as much soil as possible adhere to the roots of the plants. Take up the plants with a trowel or spade and pack them in boxes to carry to the field. When the plants are grown in pots, plant bands, or tin cans, all of the soil should remain around the roots, as shown in figure 4. Set the plants in the furrow and pack the soil around them with the hand. The remainder of the furrow can be filled by running a turnplow on either side of the row, throwing the soil in the furrow. Do not open the furrows very far ahead of the planting, as the soil dries out when exposed to the air. When the soil is very dry at planting time, use enough water to moisten the soil around the plant, and after the water has soaked into the soil pull some loose dry earth over the moistened area.

CULTIVATION.

Give the tomatoes frequent shallow cultivation in order to keep down the weeds and maintain a loose soil mulch over the surface to prevent evaporation. Cultivate after each rain, as soon as the ground is in condition to work. Do not allow a crust to form. As a general rule, a small-tooth cultivator should be used rather than a shovel plow, sweep, or turnplow. Keep the soil loose between the plants by the use of a hand hoe, and keep the weeds down at all times, as they rob the soil of moisture and plant food that should go to the tomatoes.

PRUNING AND STAKING.

It is customary in the South to prune the tomato plants and tie them to stakes. Soon after the plants are set out a stake made from a sapling, a mill edging, or a 1 by 1 inch strip 4 or 5 feet long is driven down near each plant and the stem is tied to it, as shown in figure 6. The plants are pruned to one or two main stems, and all the shoots that grow in the axils of the leaves are pinched out. These shoots should not be allowed to get large, as they take the nourishment away from the main stems. Use a soft twine for tying the plants to the stakes and have it loose about the stem, so as not to interfere with the development of the plant. A good plan is to loop the string around the stake and tie it around the plant under a leaf stem. Go over the field once every week or 10 days to pinch out the shoots and keep the plants tied up to the stakes.

The staking and pruning will expose the fruit to the air and sunlight and cause it to ripen more evenly than if left lying on the ground. The fruit will also be earlier and more uniform in size, but the crop will probably not be any larger. The tomatoes can be cultivated and sprayed to better advantage when trained to stakes or trellises of any kind. Figure 7 shows vines trained to twine trellises.

ROTATION.

Tomatoes should not be grown on the same land year after year, because some diseases live over winter in the soil and injure the new crop. The soil can be kept in better condition by following a system of rotation, especially when some leguminous crop is grown. Potatoes, eggplants, and peppers should not follow tomatoes, as some

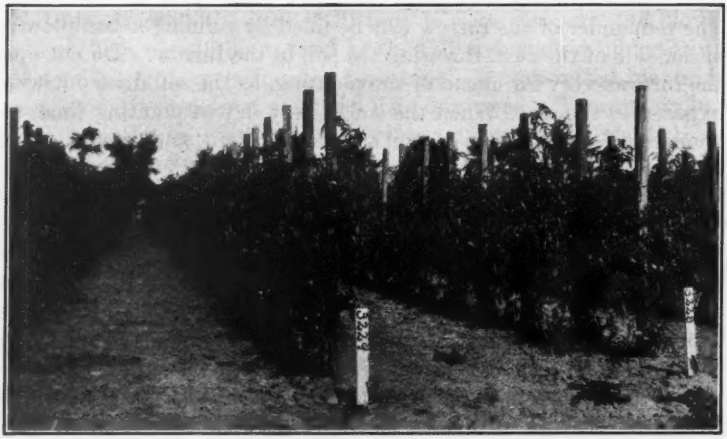

FIG. 6.—Tomato plants tied to stakes as supports. These stakes are larger than those commonly used in the South.

of the same diseases and insects affect all of these plants. It is better to follow tomatoes with such crops as peas, beans, cabbage, or a general farm crop. It would be a good plan to plant a cover crop on the land after the tomatoes are harvested. Where the season is long enough for getting a good growth, cowpeas, crimson clover, or some other leguminous crop should be grown. If the tomatoes are not harvested until late summer or fall, rye or oats and winter vetch could be sown for a cover crop and turned under. The year preceding the growing of tomatoes it would be a good plan to grow corn with cowpeas, soy beans, velvet beans, or peanuts between the rows. Turn under the vines and corn stubble in the fall or winter to furnish humus. Whatever system is followed, a leguminous crop should be turned under once in two years. This can be done the same season a money crop is produced.

DISEASES OF TOMATOES.

There are many diseases affecting the tomato in the South, and in order to grow the crop successfully it is necessary to practice certain preventive measures, as follows:

(1) Where diseases are causing considerable damage, tomatoes should not be planted on the same land more than once in three years.

(2) Practice a good system of rotation, but avoid growing potatoes, eggplants, and peppers in the rotation with tomatoes, as some of the same diseases affect all of these plants. Do not plant tomatoes on land that has grown any plant affected with root-knot. (See fig. 5.)

(3) Do not use soil for the seed bed that has grown diseased plants. It is best to change the soil in the seed bed each year.

FIG. 7.—Tomato plants trained on twine trellises.

(4) As a preventive measure spray with Bordeaux mixture every week or 10 days, giving the first spraying before removing the plants from the bed. Tying the plants to stakes is an aid in thorough spraying and allows a free circulation of air.

(5) Practice a system of cultivation which keeps the plants in a thrifty growing condition at all times. A weak or stunted plant will ordinarily be injured by disease quicker than a strong-growing plant.

(6) Where the blossom end-rot is serious, practice irrigation, if possible, as lack of moisture is probably one of the main causes of this trouble. Spraying is of no value to keep this disease in check.

(7) In case of serious outbreaks of disease, write to your State agricultural experiment station or to the United States Department of Agriculture. Several of the experiment stations have bulletins on diseases of tomatoes, and each grower should have the publications from the station in his State.

(8) Avoid the use of fresh manure the same season the tomatoes are grown.

(9) Pull up and burn all diseased plants when disease first appears.

SPRAYING TOMATOES.

To secure the best results in spraying, the spray material should be applied before the disease appears, as all treatments are preventive rather than curative. Begin the spraying while the plants are still in the seed bed, and keep the plants well covered with the spray solution at all times. Use a nozzle which gives a fine mist; thoroughly cover but do not drench the plants.

FIG. 8.—Tomatoes wrapped and packed in peach or tomato baskets, which are shipped in 6-basket carriers.

Bordeaux mixture is the best preparation to use as a spray. The formula for making it is as follows:

Copper sulphate (bluestone) ...	4 pounds.
Quicklime.....	4 pounds.
Water.....	50 gallons.

Dissolve the copper sulphate by suspending it in a bag near the top of the water in a wooden or stone vessel. Slake the lime in another vessel, dilute each solution separately up to 25 gallons, and pour together the dilute solutions. Stir the mixture thoroughly while the two ingredients are being united, and keep it well stirred while it is being applied. After the solutions are poured together they should be used immediately.

When Bordeaux mixture is used in large quantities, it is advisable to make stock solutions. This can be done by dissolving 50 pounds of copper sulphate in 50 gallons of water, slaking 50 pounds of lime, and diluting to 50 gallons. The stock solutions must be thoroughly stirred before they are used, in order that they may be of uniform strength throughout. To make up 50 gallons of Bordeaux mixture, take 4 gallons of the copper-sulphate solution and dilute to 25 gallons and 4 gallons of the lime water diluted to 25 gallons. Then pour the two solutions together into the spray tank, as already described.

HARVESTING.

Fruits for a local market should be well colored and firm when picked. For long-distance shipping the fruits are picked when they have reached full size and begin to turn red, but the stage of ripeness at which they should be picked depends upon the distance shipped

and the season of the year. The shorter the time required to reach the market, the riper the fruit should be. When the weather is warm, the fruit should be picked greener than during cool weather.

All rough, cracked, and deformed fruits should be separated from those intended for market. The more uniform in size, shape, and color the higher the price received for the fruit. For a fancy product the fruits should be of medium size, uniform in every particular, and each fruit should be wrapped in thin paper and placed in a package similar to that shown in figure 8.

The packages most commonly used are the half-peck peach or tomato baskets, which are packed in 4 or 6 basket carriers, as shown in figures 8 and 9. Some growers ship in hampers of various sizes, but these are not very satisfactory, because there is too much weight on the bottom layers. Use a broad, flat package that will distribute the weight evenly over the surface.

FIG. 9.—A 4-basket carrier used in some sections of the South for shipping tomatoes.

Fruit for canning should be thoroughly ripe, but not soft. A tomato that is not ripe will give a straw-colored product, and one overripe will give a "mushy" product. (See Farmers' Bulletin 521, entitled "Canning Tomatoes at Home and in Club Work.")

VARIETIES.

In selecting varieties of tomatoes it is important to have in mind the purpose for which they are to be grown. A good variety for a home garden or local market may not be good for long-distance shipping. Sparks' Earliana is one of the best early tomatoes for the home garden or local market, but it is not a good shipper. The Bonny Best and Chalk's Early Jewel are good early tomatoes for shipping, and the Greater Baltimore, Red Rock, Globe, Favorite, Beauty, Acme, and Stone are good medium and late varieties. For canning, bright-red varieties are desirable, because they give a rich red color when processed. The Stone or a variety of this type is usually preferred by canners.

COST OF GROWING, YIELDS, AND RETURNS.

The cost of growing tomatoes varies between wide limits, depending on the locality, methods of culture, and purpose for which grown. The cost of growing for the canning factory is much less than growing for market, because of the difference in the methods of culture.

When grown for the market, the plants are usually pruned and staked, more fertilizer is used, greater care is exercised in picking, the tomatoes are graded and packed, and the packages are given away, all of which add greatly to the cost. The average cost of growing an acre of tomatoes for the canning factory is about $40, distributed as follows:

Rent of land	$5.00
Plowing and fitting the land	3.50
Cost of plants	2.25
Cost of fertilizer	7.00
Setting plants	1.50
Cultivation	3.00
Picking	8.00
Hauling to factory, etc	10.00
Total cost	40.25

At $40 an acre it requires a 5-ton yield to cover the cost of growing and marketing, at the average price received at the canning factory. With a yield of 8 tons to the acre, which is a good average crop, a good profit would be secured.

The cost of growing an acre of tomatoes for market averages about $90 to $100. The highest cost is in Florida, and it would probably run considerably higher than the estimate given. Taking the South as a whole, the average cost is distributed about as follows:

Rent of land	$5.00
Plowing and fitting	4.00
Growing plants	4.00
Fertilizer	15.00
Setting plants	5.00
Staking, pruning, and tying	8.00
Stakes	3.50
Cultivation	3.00
Picking and packing	15.00
Packages	20.00
Hauling, loading, etc	15.00
Total cost	97.50

In most seasons a good profit would be secured where the yield is 150 to 200 bushels to the acre, although it is only the grower who is above the average who makes more than the cost of production. With more improved methods the yield in some sections could be considerably increased. Early tomatoes are often followed by some other cash crop, such as fall beans, cabbage, or sweet potatoes, or by a soil-improving crop, such as cowpeas or soy beans. The cash crop will add to the profit of the season, and the crop turned under will improve the mechanical condition of the soil and add to its store of plant food.

SUMMARY.

In order to secure an early crop of tomatoes in most sections of the South, hotbeds or cold frames are necessary in starting the plants.

For best results the seedlings should be transplanted at least once before setting in the field.

A well-drained sandy-loam soil gives the best results. Avoid soil that has been in tomatoes the previous year or has grown any crop affected with nematodes.

The land should be plowed in the fall if there is no danger of serious washing. A deep soil is desired, but the depth should be increased gradually.

Barnyard or stable manure should be used, if available, but on most soils some commercial fertilizer in addition could be used to advantage. Where no manure is available, green crops should be turned under and commercial fertilizer used.

Thoroughly soak the plant bed with water before removing the plants, in order to have as much soil as possible adhere to the roots.

Give frequent shallow cultivation.

Prune plants to one or two stems and tie to stakes for market tomatoes. The fruit will ripen earlier and be more uniform in size, color, shape, etc., when pruned and staked.

A systematic crop rotation should be followed. Tomatoes should not follow any crop which is affected by the same diseases as those to which the tomato is subject. Whenever possible, turn under a green crop, such as cowpeas, soy beans, or crimson clover, every year or every two years.

Where fungous diseases are prevalent, spray with Bordeaux mixture as a preventive.

Carefully grade and pack the product in neat, attractive packages.

The cost of growing tomatoes for the canning factory averages about $40 an acre. Growing for market, including picking, packing, packages, etc., averages about $97 an acre.

With a yield of 8 tons or more, a good profit is made when the tomatoes are grown for the canning factory. A yield of 150 to 200 bushels to the acre will ordinarily give a good profit when the tomatoes are grown for market.

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